

REMARKS

Support for previous amendments

In the present office action, the examiner stated that support for the amendments was not found at the locations cited on pp. 4,5,7,8 and original claim 8, and requested clarification.

Claims 11, 19 and 25 were amended to provide that the heating step occurred under an atmosphere consisting essentially of O_2 and $H_2O_{(g)}$ gas (Claim 11), " O_2 and $H_2O_{(g)}$ is applied to said metal oxide sample at a linear flow rate of about 50 ccm to about 350 ccm" (Claim 19) and "under an atmosphere consisting essentially of O_2 and $H_2O_{(g)}$ gas, wherein said O_2 and $H_2O_{(g)}$ is applied to said metal oxide sample at a linear flow rate of about 50 ccm to about 350 ccm" (Claim 25).

See page 4, lines 16 & 18 recite the fact that the heat treatment was conducted under "different atmospheres" and refer to the list of "different atmospheres" in FIGS. 2 and 3. Page 5, line 10, provides that the heating occurred under "various atmospheric conditions". Page 7, line 5, discusses that the experiments were conducted under "temperature/atmosphere/time conditions". Page 8, line 19 discusses the "temperature/atmosphere treatment". Original claim 8 provides that the gas is a mixture of O_2 and $H_2O_{(g)}$. Further, FIG. 2 lists the various "atmospheres" to include O_2/H_2O . FIG. 3 provides, in sample (c), that the sample was " O_2/H_2O annealed".

Thus, the support for the amendments to the claims for heating under an $O_2/H_2O_{(g)}$ atmosphere are supported at the above referenced pages. Applicants respectfully submit that this provides the requested clarification by the examiner and respectfully request reconsideration.

Rejection under 35 U.S.C. §112

The examiner has rejected Claims 11, 17-25 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applications regard as their own. Specifically, the examiner states that "the lithium capacity" lack(s) proper antecedent basis in the claims.

Applicants have amended claims 11 and 25 to provide proper antecedent basis in the claims. Applicants respectfully submit that the examiner's rejection has been overcome and request reconsideration.

Rejection under 35 U.S.C. §103(a)

The examiner has rejected claims 11, 17, 18, 23 and 24 under 35 U.S.C. §103(a) as being unpatentable over Thome ,707 in view of either Nishihara '181 or the Chemical Principles references to show a statement of fact.

The examiner states that "Tome suggests the process of heating a metal oxide, eg. V_2O_5 at 550 °C for about 8 hours in a flowing gas mixture of air and water vapor and cooling the metal oxide. The metal oxide appears to have the instantly claimed surface area; in any event the size of an article ordinarily is not a matter of invention. Air itself contains water vapor, ie. H_2O gas."

Applicants believe the previous amendments overcome the examiner's rejection. The applicant has clarified that the heating step occurs under an atmosphere consisting essentially of O_2 and H_2O gas. These conditions were described in the specification on page 4, lines 16 & 18, page 5, line 10, page 7, line5, page 8, and line 19. The heating step is conducted under an O_2 and H_2O atmosphere. Those skilled in the art would understand that an "atmosphere", as claimed, equals 1 atm, thus 100% oxygen.

It is well accepted that "air" is 21% O_2 + 79% N, therefore the oxygen partial pressure is 0.21 atm. The present claims uses oxygen as a "reagent", so the partial pressure is one atmosphere, or 1 atm, the oxygen partial pressure is 100% in the making the O_2/H_2O mixture. In contrast, for the Ar/H_2O mixture presented in the specification, the oxygen partial pressure is very low, somewhere less than 0.001 atm, assuming that the water disproportionates to O_2 and H_2 . The difference in the reagent concentration affects the resulting stoichiometry of the metal oxide material, as it reaches equilibrium with the concentration of reagents in the gas, according to equation 2 in the paper.

The examiner has stated that the “Thome first forms V_2O_5 and then heats in a gas mixture of oxygen and water vapor which is instantly claimed.” However, the examiner has not provided an exact citation within Thome that provides that the formed V_2O_5 is then heated. Applicants respectfully request that the examiner clarify this statement as to where Thome heats formed V_2O_5 .

Thome provides, in Col. 1, lines 40 – 55, that ammonium metavanadate (line 41) is conducted through a heated drying zone until the water is driven off. That dried material (line 46) is conducted through a decomposition zone in which it is further heated and split into vanadium oxides (lines 46-48). Those vanadium oxides are then conducted to a “post-oxidation” zone, and oxidized to vanadium pentoxide, which is cooled and recovered (lines 51-55). Thus, Thome indicates that vanadium oxides are oxidized to vanadium pentoxide in the final step of the processing, and the vanadium pentoxide is cooled and recovered. Further, in Thome, Col. 5, lines 12-20, again discusses the conversion of ammonium metavanadate to vanadium oxides to the final product, vanadium pentoxide. “The vanadium oxides...reach the oxidation zone 5, where they are heated...Lower valent vanadium oxides are oxidized to V_2O_5 through post-oxidation by means of the inflowing fresh air.” Col. 5, lines 28-31 provide that “the end product leaving the oxidation zone contains more than 90% V_2O_5 ”. Further, Thome, in Col. 4, lines 53-67, states that the ammonium metavanadate (line 54) is conducted through a heated drying zone until the water is driven off. That dried material (line 59) is conveyed to a second zone in which it is further heated and split into vanadium oxides (lines 62). Those vanadium oxides are then conducted to a third zone in order to form vanadium pentoxide. Then the vanadium pentoxide is cooled. (lines 64-67). Applicants see no language indicating that Thome further heats the V_2O_5 once it is formed and respectfully request clarification and support for examiner’s assertion.

Further, the examiner states that the “absent a clear indication in the specification or claims of what the basic and novel characteristics actually are, “consisting essentially of” will be construed as equivalent to “comprising.”. Applicants believe that the specification and claims clearly indicate what the basic and novel characteristics actually are, that is a process that results in a specific product having specific characteristics, a defective metal oxide with increased lithium capacity wherein the process introduces local ionic defects and increases the lithium capacity of said

metal oxide. The specification clearly demonstrates the deleterious effects of heating in the presence of a low oxygen content. The applicant has clearly demonstrated that introducing additional content to the O_2/H_2O atmosphere does not result in a defective metal oxide with increased lithium capacity and local ionic defects as presently claimed. All the limitations of a claim must be considered when weighing the differences between the claimed invention and the prior art in determining the obviousness of a process or method claim. See MPEP § 2143.03. In re Ochiai, 71 F.3d 1565, 37 USPQ2d 1127 (Fed. Cir. 1995) and In re Brouwer, 77 F.3d 422, 37 USPQ2d 1663 (Fed. Cir. 1996) addressed the issue of whether an otherwise conventional process could be patented if it were limited to making or using a nonobvious product. In both cases, the Federal Circuit held that the use of per se rules is improper in applying the test for obviousness under 35 U.S.C. 103. Rather, 35 U.S.C. 103 requires a highly fact-dependent analysis involving taking the claimed subject matter as a whole and comparing it to the prior art. "A process yielding a novel and nonobvious product may nonetheless be obvious; conversely, a process yielding a well-known product may yet be nonobvious." TorPharm, Inc. v. Ranbaxy Pharmaceuticals, Inc., 336 F.3d 1322, 1327, 67 USPQ2d 1511, 1514 (Fed. Cir. 2003). Interpreting the claimed invention as a whole requires consideration of all claim limitations. Thus, proper claim construction requires treating language in a process claim which recites the making or using of a nonobvious product as a material limitation.

Further, the examiner states that the " O_2 pressure is not instantly claimed". Applicants respectfully disagree. The claims state that the metal oxide is heated under an atmosphere consisting essentially of O_2 and $H_2O_{(g)}$ gas. One skilled in the art would understand that an "atmosphere" is 1 atm. As previously discussed, heating the metal oxide at a low O_2 pressure would materially affect the basic and novel characteristics of the claimed invention, which requires heating under an atmosphere to produce a final metal oxide having local ionic defects. As discussed in the specification there are deleterious effects of heating the metal oxide at a low O_2 pressure (i.e. Ar and Ar/H_2O) as well as heating the metal oxide in an high O_2 pressure without the presence of $H_2O_{(g)}$.

The examiner further states that that the specification only makes a showing with regard to v2O5, whereas the instant claims are of much broader scope. Applicants respectfully disagree. As

provided on page 9, beginning on line 3 of the specification as originally filed, "It is suggested that other metal oxides behave similarly with the O_2/H_2O heating. Examples of metal oxides include vanadium oxide, manganese oxide, nickel oxide cobalt oxide and iron oxide. The metal oxide can be stoichiometric or non-stoichiometric in form. The metal oxide can be doped with a transition metal. Additionally, the lithiated form of the metal oxide can be used." Further, MPEP 2164.02 provides that compliance with the enablement requirement of 35 U.S.C. 112, first paragraph, does not turn on whether an example is disclosed. An example may be "working" or "prophetic." A working example is based on work actually performed. A prophetic example describes an embodiment of the invention based on predicted results rather than work actually conducted or results actually achieved. Thus, an applicant need not have actually reduced the invention to practice prior to filing. In *Gould v. Quigg*, 822 F.2d 1074, 1078, 3 USPQ 2d 1302, 1304 (Fed. Cir. 1987), as of Gould's filing date, no person had built a light amplifier or measured a population inversion in a gas discharge. The Court held that "The mere fact that something has not previously been done clearly is not, in itself, a sufficient basis for rejecting all applications purporting to disclose how to do it." 822 F.2d at 1078, 3 USPQ2d at 1304 (quoting *In re Chilowsky*, 229 F.2d 457, 461, 108 USPQ 321, 325 (CCPA 1956)). Further, the MPEP provides the presence of only one working example should never be the sole reason for rejecting claims as being broader than the enabling disclosure, even though it is a factor to be considered along with all the other factors. To make a valid rejection, one must evaluate all the facts and evidence and state why one would not expect to be able to extrapolate that one example across the entire scope of the claims.

Applicants respectfully submit, therefore that, as previously discussed, Thome does not suggest the process of heating a metal oxide at 550 °C for about 8 hours in an atmosphere consisting essentially of O_2 and H_2O gas and cooling the metal oxide. Note that the O_2/H_2O of the present invention is not the same as the examiner's recited "gas mixture of air and water vapor". Air is not the O_2/H_2O atmosphere in the present claim. Air is approximately 79% nitrogen and 21% oxygen (per the Chemical Principles reference), therefore would not be considered an "atmosphere of O_2/H_2O ", as presently claimed. One skilled in the art would understand that an "atmosphere" is 1 atm. Heating the metal oxide at a low O_2 pressure would materially affect the basic and novel

characteristics of the claimed invention, which requires heating under an atmosphere to produce a final metal oxide having local ionic defects. As discussed in the specification there are deleterious effects of heating the metal oxide at a low O_2 pressure (i.e. Ar and Ar/ H_2O) as well as heating the metal oxide in an high O_2 pressure without the presence of $H_2O_{(g)}$.

As discussed above, Thome discloses a method of producing a pure form of V_2O_5 from precursors, not a method of introducing defects in existing V_2O_5 or other metal oxides for the purpose of preparing a metal oxide for use as a battery cathode with increased capacity, as the presently claimed invention does. The final product of Thome is "bulk" V_2O_5 , which is the precursor used in the examples of the presently claimed invention. The specification, as filed, page 5, lines 13-16, states: "To examine the interaction of Li^+ with defects in the V_2O_5 lattice, commercially available, anhydrous, bulk V_2O_5 is made defective by conventional heat treatments under O_2 , O_2/H_2O , and Ar and Ar/ H_2O , and the treated materials are tested for changes in the Li capacity relative to the as-received V_2O_5 powder." Thus, the present invention used, in an example, the final product of the method of Thome and further treats it by the present method to prepare a defective metal oxide having local ionic defects and increased lithium capacity.

Nishiara and/or the Chemical Principles does not supply what Thome lacks. The examiner has stated that the Nishihara reference provides that "air itself contains water vapor". Similarly, the Chemical Principles reference states that the composition of the atmosphere contains water vapor. As discussed above, air additionally contains approximately 79% nitrogen. Additionally, air contains other components that have been demonstrated in the present specification to decrease the specific capacity of the metal oxide, which is contrary to the presently claimed invention. Specifically, the Chemical Principles reference provides that the atmosphere contains 18 specified components (plus water vapor and suspended particles). Those 18 components include O_2 and Ar (see chart in Chemical Principles reference). The specification as filed provides that the "specific capacities of the Ar-heated and O_2 -heated V_2O_5 are 8% and 25% lower than that of the as-received V_2O_5 , respectively." (see p. 7, lines 17-19 of the specification as originally filed.) Additionally, the specific capacity of the Ar/ H_2O treated V_2O_5 was 58% lower than the as-received V_2O_5 . (see p. 7, lines 14-16). Thus, heating a metal oxide in "air", which contains O_2 and Ar, as defined in either

Nishihara and the Chemical Principles, cannot be expected to prepare a defective metal oxide having local ionic defects and increased lithium capacity. Thus, the present application teaches away from the use of “air”, as air encompasses additional elements that lower the specific capacity of the treated metal oxide. Additionally, air is approximately 21% oxygen. Heating the metal oxide at a low O₂ pressure would materially affect the basic and novel characteristics of the claimed invention – the metal oxide would not contain the claimed local ionic defects nor would it have the increased lithium capacity. Additionally, the specification provides for the deleterious effects of heating the metal oxide at a low O₂ pressure (i.e. Ar and Ar/H₂O) as well as heating the metal oxide in an high O₂ pressure without the presence of H₂O_(g).

Additionally, on page 6, line 3, the present specification provides that after the heating in the atmosphere of O₂/H₂O and cooling process has been completed, the defective metal oxide that was prepared by this process was stored in sealed vials “under ambient air”. Applicants respectfully submit that the atmospheric conditions of the heating step clearly occurs under a different atmospheric conditions than the storage conditions (ambient air). Thus the specification teaches against heating in “air”.

Applicants submit that the examiner’s rejection has been overcome and respectfully request reconsideration.

Rejection under 35 U.S.C. §103(a)

Claims 11 and 24 were rejected under 35 USC §103(a) as being unpatentable over Howard ‘477 in view of either Nishihara ‘181 or the Chemical Principles reference. The examiner states Howard suggests “the process of heating a metal oxide sample, eg, LiMn₂O₄, in flowing air at the instantly claimed flow rate. Air contains water vapor or H₂O gas according to Nishihara and the Chemical Principles reference. The metal oxide appears to have the instantly claimed surface area; in any event the size of an article ordinarily is not a matter of invention.”

Applicants believe the previous amendments overcome the examiner's rejection. The applicant has clarified that the heating step occurs under an atmosphere consisting essentially of O₂ and H₂O. These conditions were described in the specification on page 4, lines 16 & 18, page 5, line 10, page 7, line 5, page 8, and line 19.

Howard does not suggest the process of heating a metal oxide at 550 °C for about 8 hours in an atmosphere consisting essentially of O₂/H₂O and cooling the metal oxide. Note that the O₂/H₂O of the present invention is not the same as the examiner's recited "gas mixture of air and water vapor". Air is not the atmosphere consisting essentially of O₂/H₂O in the present claim. Air is approximately 79% nitrogen and 21% oxygen (per the Chemical Principles reference), therefore would not be considered an "atmosphere consisting essentially of O₂/H₂O", as presently claimed. Heating the metal oxide at a low O₂ pressure would materially affect the basic and novel characteristics of the claimed invention. The specification provides for the deleterious effects of heating the metal oxide at a low O₂ pressure (i.e. Ar and Ar/H₂O) as well as heating the metal oxide in an high O₂ pressure without the presence of H₂O_(g).

Further, Howard does not teach or disclose a the present method to prepare a defective metal oxide having local ionic defects and increased lithium capacity. Howard teaches an intercalation composition and a method for making such. An intercalation composition is one where a molecule (or group) is included between two other molecules (or groups). The host usually has some periodic network. Howard teaches the use of a spinel structure and the molecule included is a trivalent metal cation that adapts to the spinel structure in place of manganese. (see col 3 line 57 – col. 4 line 23). The method Howard discloses is a method that starts with precursors and ends up with a different composition. Howard teaches "lithium manganese oxide intercalation compositions of the above formula are basically comprised of intimately mixing particulate solid reactants comprised of lithium, manganese and one or more of the above described trivalent metals in the form of oxides, thermally decomposable salts or mixtures thereof in amounts based on the above formula. The resulting intimately mixed reactants are introduced into a reactor, and the mixed reactants are heated in the reactor, preferably while continuously being agitated, in the presence of air or an oxygen enriched atmosphere at a temperature in the range of from about 550 °C to about 850 °C for a time

period of up to about 48 hours. Thereafter, the reacted product formed is gradually cooled to a temperature of less than about 500 C°.” (See Col. 3, lines 1-15). The trivalent metals are aluminum, chromium, gallium, indium and scandium. (See Col. 2, lines 64-67). Thus the starting materials, which are heated, do include a metal oxide, however, the final product has a different chemical composition after the heating step. The present invention starts with a metal oxide, does not add any other starting material, and the heating step is performed in an atmosphere consisting essentially of O₂/H₂O, and the final product has the same long-range structure but also having local ionic defects and increased lithium capacity. Page 7, lines 1-10 of the specification as filed provides “X-ray diffraction shows that the as-received, orange-colored V₂O₅ is crystalline and has the Shcherbinaite structures. The same phase is measured for the samples heated at 460 °C under O₂, O₂/H₂O, and Ar (Fig. 1), indicating that the long-range structure of the V₂O₅ is not affected by these temperature/atmosphere/time conditions and suggesting that ionic defects have been introduced.”

Thus, the present application teaches away from the use of “air” or an “oxygen enriched atmosphere”, as air encompasses additional elements that lower the specific capacity of the treated metal oxide. Additionally, an O₂-only atmosphere actually decreases the specific capacity of the defective metal oxide.

Additionally, Nishihara and/or the Chemical Principles does not supply what Howard lacks. The examiner has stated that the Nishihara reference provides that “air itself contains water vapor. Similarly, the Chemical Principles reference states that the composition of the atmosphere contains water vapor”. As discussed above, air additionally contains approximately 79% nitrogen. Additionally, air contains other components that have been demonstrated in the present specification to decrease the specific capacity of the metal oxide. Specifically, the Chemical Principles reference provides that the atmosphere contains 18 specified components (plus water vapor and suspended particles). Those 18 components include O₂ and Ar (see chart in Chemical Principles reference). Note that the present application provides that the “specific capacities of the Ar-heated and O₂-heated V₂O₅ are 8% and 25% lower than that of the as-received V₂O₅, respectively.” (see p. 7, lines 17-19 of the specification as originally filed.) Thus, heating a metal oxide in “air”, which contains O₂ and Ar, as defined in either Nishihara and the Chemical Principles, would not be reasonably

expected to produce the defective metal oxide with increased capacity having local ionic defects produced by heating the metal oxide in “atmosphere consisting essentially of O_2/H_2O ” as claimed in the present application.

Additionally, on page 6, line 3, the present specification provides that after the heating in the atmosphere of O_2/H_2O and cooling process has been completed, the defective metal oxide that was prepared by this process was stored in sealed vials “under ambient air”. Applicants respectfully submit that the atmospheric conditions of the heating step clearly occurs under a different atmospheric conditions than the storage conditions (ambient air). Thus the specification teaches against heating in “air”.

Applicants submit that the examiner’s rejection has been overcome and respectfully request reconsideration.

Rejection under 35 U.S.C. §103(a)

Claims 11, 17, 18, 19, 23, 24 and 25 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Chambers ‘005. The examiner states that “Chambers suggests the process of heating a sample of V_2O_5 at $500^\circ C$ in a stream of air saturated with water vapor, i.e., flowing gas mixture of O_2 and H_2O . See Col. 4, and example 1.”

Applicants believe the previous amendments overcome the examiner’s rejection. The applicant has clarified that the heating step occurs under an atmosphere consisting essentially of O_2 and H_2O . These conditions were described in the specification on page 4, lines 16 & 18, page 5, line 10, page 7, line 5, page 8, and line 19. The heating step is conducted under an O_2 and H_2O atmosphere.

Chambers does not suggest the process of heating a metal oxide at $550^\circ C$ for about 8 hours in atmosphere consisting essentially of O_2 and H_2O and cooling the metal oxide. Note that the O_2/H_2O of the present invention is not the same as the recited “gas mixture of air and water vapor”.

Air is approximately 79% nitrogen and 21% oxygen (per the Chemical Principles reference), therefore would not be considered an atmosphere consisting essentially of O_2/H_2O , as presently claimed. Heating the metal oxide at a low O_2 pressure would materially affect the basic and novel characteristics of the claimed invention. The specification provides for the deleterious effects of heating the metal oxide at a low O_2 pressure (i.e. Ar and Ar/ H_2O) as well as heating the metal oxide in an high O_2 pressure without the presence of $H_2O_{(g)}$.

Additionally, the Chambers teaches a method of separating vanadium from vanadium bearing material. Chambers teaches the use of raw material, such as "titanium slag" (see example 1) and extracting from it pure vanadium. Chambers neither teaches nor discloses a method to prepare a defective metal oxide having local ionic defects and increased lithium capacity as presently claimed. Chambers applies heat to vanadium precursors (slag) that is exposed to air and water vapor at an elevated temperature, wherein the vanadium present in the slag volatilizes in the form of the hydroxide and that hydroxide decomposes upon cooling to a mixture of water vapor and vanadium oxide. The vanadium oxide product of Chambers is equivalent to the bulk vanadium oxide starting material of the present specification. Chambers does not teach or disclose a method to prepare a defective metal oxide having increased capacity and local ionic defects, as claimed in the present invention.

Additionally, Nishiara and/or the Chemical Principles does not supply what Chambers lacks. The examiner has stated that the Nishihara reference provides that "air itself contains water vapor. Similarly, the Chemical Principles reference states that the composition of the atmosphere contains water vapor". As discussed above, air additionally contains approximately 79% nitrogen. Air contains other components that have been demonstrated in the present specification to decrease the specific capacity of the metal oxide. Specifically, the Chemical Principles reference provides that the atmosphere contains 18 specified components (plus water vapor and suspended particles). Those 18 components include O_2 and Ar (see chart in Chemical Principles reference). Note that the

present application provides that the “specific capacities of the Ar-heated and O₂-heated V₂O₅ are 8% and 25% lower than that of the as-received V₂O₅, respectively.” (see p. 7, lines 17-19 of the specification as originally filed.) Thus, heating a metal oxide in “air”, which contains O₂ and Ar, as defined in either Nishihara and the Chemical Principles, would not be reasonably expected to produce the defective metal oxide with increased capacity having local ionic defects produced by heating the metal oxide in “O₂/H₂O” as claimed in the present application.

Additionally, on page 6, line 3, the present specification provides that after the heating in the atmosphere of O₂/H₂O and cooling process has been completed, the defective metal oxide that was prepared by this process was stored in sealed vials “under ambient air”. Applicants respectfully submit that the atmospheric conditions of the heating step clearly occurs under a different atmospheric conditions than the storage conditions (ambient air). Thus the specification teaches against heating in “air”.

Applicants submit that the examiner’s rejection has been overcome and respectfully request reconsideration.

Rejection under 35 U.S.C. §103(a)

The examiner has rejected claims 11, 17, 18, 20-22 and 24 under 35 U.S.C. 103(a) as being unpatentable over Shizuka ‘637 in view of either Nishihara ‘181 or the Chemical Principles reference. The examiner stated “Shizuka suggests the process of heating a metal oxide, e.g. Mn₂O₃, Co₃O₄, in air to 500°C for 6 hours at a rate of 5°C/min and then cooling the metal oxide to room temperature, ie. ambient, at a rate of 5°C/min. [...] See examples 1-5, 8. Air contains water vapor, ie, H₂O gas. See Nishihara, Col. 2, line 23 and the Chemical Principles reference.

Applicants believe the previous amendments overcome the examiner’s rejection. The applicant has clarified that the heating step occurs under an atmosphere consisting essentially of O₂ and H₂O. These conditions were described in the specification on page 4, lines 16 & 18, page 5,

line 10, page 7, line5, page 8, and line 19. The heating step is conducted under an atmosphere consisting essentially of O_2 and H_2O .

Shizuka does not suggest the process of heating a metal oxide at $550\text{ }^{\circ}\text{C}$ for about 8 hours in an atmosphere consisting essentially of O_2 and H_2O and cooling the metal oxide. Note that the O_2/H_2O of the present invention is not the same as the recited “gas mixture of air and water vapor”. Air, as discussed below in more detail, is not the atmosphere consisting essentially of O_2 and H_2O in the present claim. Air is approximately 79% nitrogen and 21% oxygen (per the Chemical Principles reference), therefore would not be considered an atmosphere consisting essentially of O_2/H_2O , as presently claimed. Heating the metal oxide at a low O_2 pressure would materially affect the basic and novel characteristics of the claimed invention. The specification provides for the deleterious effects of heating the metal oxide at a low O_2 pressure (i.e. Ar and Ar/ H_2O) as well as heating the metal oxide in an high O_2 pressure without the presence of $H_2O_{(g)}$.

Further, Shizuka does not teach or disclose a method to prepare a defective metal oxide having increased capacity and local ionic defects, as claimed in the present invention. Shizuka introduces a molecule into a spinel structure. All of Shizuka’s examples include several starting materials that are blended. The metal oxide is one of the several starting materials (see col. 6, line 41, and examples). The starting materials are blended and calcined to create a new material with a different chemical composition than any of the starting materials. No mention of a defective metal oxide having increased capacity and local ionic defects is made. Additionally, the firing process of Shizuka is carried out in “air or an oxygen atmosphere” (Col. 7, line 14), followed by an annealing process carried out in an “oxygen atmosphere” (Col. 7, line 15-16) (see examples 1-5, 8). Thus, the present specification teaches away from the disclosure of Shizuka, in that neither “air” nor an “oxygen atmosphere” will produce the local ionic defects of the present invention.

Nishiara and/or the Chemical Principles does not supply what Shizuka lacks. The examiner has stated that the “Nishihara reference provides that “air itself contains water vapor”. Similarly, the Chemical Principles reference states that the composition of the atmosphere contains water vapor”. While the air itself does contain water vapor, it also contains other components that have

been demonstrated in the present specification to decrease the specific capacity of the metal oxide. Specifically, the Chemical Principles reference provides that the atmosphere contains 18 specified components (plus water vapor and suspended particles). Those 18 components include O_2 and Ar (see chart in Chemical Principles reference). Note that the present application provides that the "specific capacities of the Ar-heated and O_2 -heated V_2O_5 are 8% and 25% lower than that of the as-received V_2O_5 , respectively." (see p. 7, lines 17-19 of the specification as originally filed.) Thus, heating a metal oxide in "air", which contains O_2 and Ar, as defined in either Nishihara and the Chemical Principles, would not be reasonably expected to produce the defective metal oxide with increased capacity having local ionic defects produced by heating the metal oxide in " O_2/H_2O " as claimed in the present application.

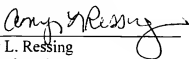
Additionally, on page 6, line 3, the present specification provides that after the heating in the atmosphere of O_2/H_2O and cooling process has been completed, the defective metal oxide that was prepared by this process was stored in sealed vials "under ambient air". Applicants respectfully submit that the atmospheric conditions of the heating step clearly occurs under a different atmospheric conditions than the storage conditions (ambient air). Thus the specification teaches against heating in "air".

Applicants submit that the examiner's rejection has been overcome and respectfully request reconsideration.

In view of the above amendment, applicant believes the pending application is in condition for allowance.

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Respectfully submitted,

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